Trauma Rounds

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Management of Pancreatic Injuries

JOHN WILSON, MD:* A 17-year-old boy received a blow to the head and a steering wheel injury to the abdomen in an automobile accident. When admitted to the Emergency Room he was complaining of abdominal pain. He responded to questioning but was restless, agitated and combative and was thrashing about wildly.

On physical examination blood pressure was 125/70 mm of mercury with a pulse rate of 110. He had multiple facial lacerations which were bleeding profusely, and a contusion about the left eye. He was able to take a deep breath without apparent discomfort. The lungs were clear and the abdomen was relatively soft but difficult to evaluate because the patient would not hold still during the examination. Peripheral perfusion seemed adequate although the extremities felt a bit cool.

Tubes were placed in the basilic and greater saphenous veins and a Foley catheter was inserted into the bladder. The hematocrit was 41 percent. The urine was clear. Cervical, skull, chest and abdominal x-ray films were considered normal.

Approximately two liters of Ringer's lactate solution was infused within one hour after entry. The blood pressure had remained stable at 120/70 mm of mercury but the hematocrit had fallen to 33 percent. The abdomen did not change appreciably although there appeared to be slight spasm of the upper abdominal muscles. Two hours after admission the urinary output dropped to 20 ml per hour and blood pressure fell to 85/40 mm.

At laparotomy, a liter of blood was found in the abdominal cavity, most of it coming from a rupture of the spleen. On examination of the lesser sac a complete fracture of the body of the pancreas and a mesenteric hematoma were noted. The spleen was removed in continuity with the distal portion of the pancreas. The pancreatic duct was identified in the proximal portion of the divided pancreas and was suture-ligated. Tubes were placed in the left flank to drain the pancreatic bed. The patient received 5 units of packed cells and 3 liters of crystalloids during operation.

Postoperatively the blood pressure was normal and the hemocrit was 41 percent. Urinary output was excellent. The patient remained confused, combative and somewhat disoriented, but his mental status gradually returned to normal over the next several days. At the time of this report, one week after injury, he was alert and oriented. The drains had not been removed but otherwise he was ready for discharge.

DONALD TRUNKEY, MD:† I would like to mention that when this patient first came into the Emergency Room he was described as restless and agitated. Such behavior might be attributable to

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a head injury or to the taking of drugs or ingestion of alcohol, but these findings can also be due to severe hypovolemia. In these circumstances, it is up to the emergency room physician to prove that it is not hypovolemia by monitoring peripheral perfusion (skin temperature) and urinary output.

Dr. Steele,* you have been personally responsible for the management of many of these pancreatic injuries and have recently reviewed the experience at San Francisco General Hospital. Will you comment on the management of this particular patient and pancreatic injuries in general?

DR. STEELE: It was stated at the onset that this patient had a steering wheel injury to the epigastrium. Any patient who has an injury of this type is at risk of damage to the liver, the spleen and, in particular, the pancreas. This is the typical mechanism for production of a pancreatic rupture. The pancreas fractures over the vertebral column when the epigastrium is crushed against the steering wheel of a car. Liver and spleen injuries produce manifestations of hypovolemia, and the splenic injury in the case we are discussing might even be considered fortunate, since it led to the early diagnosis of the pancreatic injury. Pancreatic injuries are notoriously diagnosed late because damage to this retroperitoneal organ often does not produce much in the way of abdominal findings. Typically these patients have abdominal pain which may be out of proportion to the clinical findings. Therefore, a blow to the epigastrium combined with epigastric pain and even minimal epigastric tenderness should lead to a high index of suspicion of pancreatic injury; and it indicates the need for laparotomy. A high leukocyte count and abnormal serum amylase content tend to support the diagnosis, although normal amylase content does not rule out injury.

The primary problem in pancreatic trauma once laparotomy is carried out is assessment of the injury. In this particular patient the injury was obvious. The pancreas was fractured in the typical location right at the neck where the pancreas passes over the vertebral column. This patient also had considerable hematoma in the mesocolon, which pointed to the injury. The proper treatment was carried out and the patient should do well. There is a fair chance that he will have a temporary pancreatic fistula but this should be benign, as it is unlikely the proximal portion of the duct was damaged by the injury.

In the average case, assessment of the degree of injury to the pancreas is the primary problem. Penetrating injury is not difficult to assess, for major disruption of the gland is apparent. Penetrating injuries of the body or tail are best treated by distal resection. Injuries to the head will be described later.

Assessing blunt traumatic injury is more difficult. In any case of upper abdominal injury the pancreas should be systematically explored at the time of laparotomy. This should be done by a specific routine. Initially the transverse colon and omentum should be elevated superiorly and the retroperitoneum inspected in the vicinity of the ligament of Treitz and around the root of the mesocolon. The presence of blood, induration or saponification is suggestive of pancreatic injury. Next, the anterior surface of the pancreas should be inspected. This requires entering the lesser sac. The most appropriate way to enter the lesser sac is by detaching the omentum from the colon so as to avoid dividing gastroepiploic vessels and devascularizing the greater curvature of the stomach. Although in normal circumstances the stomach has good blood supply, the combination of injury and shock may produce intense splanchnic vasoconstriction so that interruption of any portion of the blood supply of the greater curvature may aggravate ischemic damage to the stomach and set the stage for subsequent "stress ulceration."

Upon opening the lesser sac, gentle retraction of the stomach permits inspection of most of the anterior surface of the pancreas. If there is hemorrhage over the gland, then the tail along with the spleen should be mobilized upward to the right to permit inspection of the posterior aspect of the body and tail and careful bimanual palpation of the gland to determine its integrity.

Next, the retroperitoneum is inspected just lateral to the duodenal sweep. If there is hemorrhage around or lateral to the duodenum, a Kocher maneuver should be carried out and the head of the pancreas inspected posteriorly and palpated bimanually. Without careful palpation of areas which appear to represent trivial injuries, it is difficult to recognize the full extent of the problem. All too often the hematoma will smooth out the anatomic structure so that unless it is palpated carefully, the full magnitude of the disruption of the gland is not ascertained.

If the integrity of the pancreas seems relatively

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normal, drainage is carried out. If the integrity of the gland is compromised, distal resection is indicated, assuming the area of injury involves the neck, body or tail as is the case with most blunt injuries. In approximately 50 percent of our patients with pancreatic injuries resection is required, and the remainder are managed by drainage.

When the injury involves the head of the pancreas, one method of management is the Whipple procedure. In most series, including our own, this results in an unacceptably high mortality and morbidity, and its use should be limited to extensive disruptions of both the head of pancreas and the duodenum, such as are occasionally produced by gunshot wounds. A better alternative, when the injury is extensive but limited to the head of the pancreas, is to carry out an extensive distal resection leaving enough pancreas to preserve the blood supply of the duodenum. For the combined pancreaticoduodenal injury, diversion of gastric contents from the duodenum with repair and drainage of the injured areas as described by Byrne may be appropriate; and this procedure provides a better chance of survival from these potentially lethal injuries. The operation includes resection of the antrum of the stomach and a gastrojejunostomy. This converts the duodenum into a conduit limited to bile and pancreatic juice. By separating the gastric contents from the pancreatic enzymes, activation of the latter is avoided along with many of the hazards of digestion of suture lines and upper abdominal structures. In the few instances we have used this procedure it has worked very well and is much better tolerated by patients with multiple injuries. Patients who have the duodenal diverticulization should also have vagotomy. This puts the pancreas at rest and lessens the risk of "stress ulceration" of the stomach.

On the rare occasion in which you are forced to do a Whipple operation, I do not believe you should attempt to reimplant the distal end of the pancreas into the gastrointestinal tract. You should either ligate the duct and drain it in an attempt to preserve endocrine function, or resect the pancreas totally, to avoid the possibility of adding a pancreatic fistula to the patient's problems. Patients with complicated injuries do poorly, and physicians treating them should accept the morbidity of total pancreatectomy to preserve life.

In all pancreatic injuries, drains should be placed whether or not resection has been carried out. Large Penrose drains with or without a sump drain should be inserted in the pancreatic bed or over the area of injury. These should be brought out the flank in as dependent a position as possible.

A PHYSICIAN: *If there is questionable damage to the duct, is that an indication for some type of pancreatography or re-exploration at a later date?*

DR. STEELE: I would be opposed to the latter. Twenty-four hours after injury the pancreas is a greater problem to deal with than it was initially. If the patient's pancreas had been slightly injured, there is often considerable inflammation around the gland 24 hours later, making it very difficult to assess. As to whether or not we can endoscopically cannulate the pancreatic duct for pancreatography, we still have not reached the point clinically where this is readily done and is practical. As our experience with pancreatography increases, this may prove to be a practical clinical adjunct. In the normal gland, the distal portion of the duct is difficult to identify. I do not believe you should go so far as to open the duodenum to cannulate the pancreatic duct because then you create the potential for a combined pancreatic and duodenal fistula.

A PHYSICIAN: *Is there any justification for attempting to salvage the distal pancreas when the gland is completely divided, as it was in this case today?*

DR. STEELE: Patients tolerate distal pancreatectomy well, and if as much as 20 percent of the pancreas is preserved, there is little chance that endocrine or exocrine deficiency will result.

The primary risk in all pancreatic injuries is the development of a pancreatic fistula. The overall mortality from pancreatic injuries is 20 percent and about half the survivors have serious complications. Approximately two-thirds of patients have serious associated injuries, which are the usual cause of death. At San Francisco General Hospital, you would have to go back about 15 years to find a death from a solitary pancreatic injury. Complications are frequent and involve about 50 percent of the patients. These are related mainly to pancreatic fistula or to subphrenic infections. At the San Francisco General Hospital, our mortality is running about 16 percent.

DR. TRUNKEY: Let me summarize the presentation by Dr. Steele as follows:

Signs of pancreatic injury are often subtle; and clinical recognition may be difficult. Whenever

there is history of major blunt trauma to the epigastrium, particularly a steering wheel injury, the possibility of pancreatic injury is real. The patient often has abdominal pain out of proportion to the physical findings. Elevation of serum amylase content or a rising leukocyte count may be clues to the injury.

At laparotomy, systemic exploration of the pancreas is indicated. This requires inspection of the base of the mesocolon around the ligament of Treitz, opening the lesser sac, inspecting the anterior surface of the gland and examining the area around the duodenal sweep. The presence of blood requires further assessment which includes a Kocher maneuver to inspect and palpate the head of the gland if there is hematoma around the duodenum, or mobilization of the body and tail should evidence of more distal injury be present.

Disruption of the integrity of the gland should be treated by distal resection for injuries of the body or tail. Major disruptions of the head of the gland, in the absence of duodenal injury, can be treated by radical distal resection. If the injury involves the duodenum, gastric diversion should be considered, utilizing distal gastric resection with gastroenterostomy combined with vagotomy. Only in the presence of severe devascularizing injuries of the head of the pancreas and the duodenum should a Whipple resection be considered. Drainage should be used routinely in all pancreatic injuries whether or not resection is carried out.

Epilepsy and Intercourse

MOST ADOLESCENTS who are epileptic are extraordinarily preoccupied with whether or not they will have a seizure while having intercourse. If you think about it, most post-pubertal youngsters are extremely interested in sexuality and "when is it going to happen to me?" The epileptic adolescent, of course, gets highly preoccupied as to whether he will, as it were, lose control during the sex act. In my clinical experience, it's rare indeed that this is an issue that's ever discussed with them. I used to be able to feel comfortable, actually, that one could be quite flatly reassuring with youngsters, because it never happened. But, regrettably, it does, because I saw a young man the other day who, in fact, did have a grand mal seizure while having intercourse.

—DEREK MILLER, MD, *Ann Arbor*
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